INDIVIDUAL DIFFERENCES IN DEDUCTIVE REASONING: FORMAL AND THEMATIC WASON´S THOG PROBLEMS*

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INTRODUCTION

This study forms part of a wider research project aimed at investigating relationships between cognitive skills and performance on experimental reasoning tasks (Stanovich, 1999; Stanovich & West, 1998). The study aims to replicate and expand our previous studies of individual differences, both in conditional reasoning (Seoane, Valiña, Ferraces & Martín, 1997; Valiña, Seoane, Ferraces & Martín, 1993; 1995; 2000) and disjunctive reasoning (Martín, Seoane, Valiña & Ferraces, 1998; Martín & Valiña, 2002; 2003).

Specifically, this study centred on individual differences in a reasoning task: The THOG problem (Wason, 1977; Wason & Brooks, 1979). This is one of the tasks conceived by Peter Wason to "*explore the nature of thought*" (Evans & Johnson-Laird, 2003, p. 178).

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Concretely, the aims of this study were: (1) To investigate the relationships between the subjects´ performance on various computerized tests of cognitive abilities and the subjects´ reasoning with the THOG problem, and (2) to analyze the influence of rule content (formal and different thematic versions of the task) and instructions (standard / one-other) on the subjects´ performance with the THOG problem.

METHOD

Participants

179 subjects studying Psychology at the Unversity of Santiago de Compostela (Spain), participated in this study.

Materials and apparatus

Subjects performed two types of tasks: Experimental tasks and psychometric tasks, as summarized in Table 1:

TABLE 1.

Experimental and Psychometric tasks

PSYCHOMETRIC TASKS	COMPUTERIZED	Gernsbacher´s Battery Comprehension
		BAMI
	PENCIL - AND - PAPER	PMA-V PMA-R PMA-E
		DAT-VR DAT-AR DAT-SR
EXPERIMENTAL TASKS	The THOG problem (Wason & Brooks, 1979)	
	The DRUG problem (Griggs & Newstead, 1982)	
	The PUB problem (Girotto & Legrenzi, 1989)	
	The SPY problem (Girotto & Legrenzi, 1989)	
	The REPRIEVE problem (present authors, unpublished)	

RESULTS

Correlation analyses were performed to assess relationships between cognitive abilities, measured by computerized and non-computerized tests, and between these and correct answers in the experimental tasks. The correlation matrix is as follows:

	Verbal Comp.	Memory	Cognit. Flexib.	PMA V	PMA E	DAT VR	DAT AR	DAT SR
Verbal Comp								
Memory	-.025							
Cogn. Flexib.	.243	-.210						
PMA-V	**.421***	-.123	-.253					
PMA-R	.113	-.221	**.269***	.305				
PMA-E	.172	-.280	.344	.198	.262			
DAT-VR	**.336***	-.238	.388	.334	.257	.507		
DAT-AR	.114	-.322	.340	.191	.372	.451	.396	
DAT-SR	.278	-.242	**.345***	.269	.413	.367	.463	.521

The main results showed that:

» Cognitive flexibility, as measured by a computerized test, is related to spatial abilities as measured by pencil-and-paper psychometric tests, such as the PMA-E (r = .269; $p \leq .001$) and the DAT-SR (r = .345; $p \leq .001$).

» Verbal Comprehension, as measured by a computerized test, is related to verbal abilities as measured by pencil-and-paper psychometric tests such as the PMA-V (r= .421; $p \leq .001$) and the DAT-VR (r = .336; $p \leq .001$).

In addition, we performed ANOVAs to test the differential influence of rule content and instruction on subjects´performance on the different versions of formal and thematic Wason´s THOG problem.

The main results obtained were that:

» Both *instructions* ($F_{(1,172)} = 18.5$, $p \leq .001$) and *content* ($F_{(1,172)} = 7.51$, $p \leq .007$) had significant main effects, but there was no significant interaction between these two factors.

» Thematic content facilitated task performance. Of the total of 90 correct answers, 63.3 % were in the tasks with thematic content, versus 36.7 % in tasks with formal content.

» The use of one-other instructions improved performance, both in tasks with formal content and tasks with thematic content; in these latter, 67.8% of correct answers were obtained with one-other instructions, versus 32.3% with standard instructions.

The percentage of correct answers in the different thematic versions was as follows: 79.3% in the pub problem, 61.5% in the spy problem, 60.6% in the drug problem, and 35.2% in the reprieve problem.

The results of this study are not consistent with syntactic theories of resoning, and need to be explained in terms of the two principal general theories of deductive reasoning: The Mental Models Theory (Johnson-Laird, 1983, 2000; Johnson-Laird & Byrne, 1991) and the Dual Process Theory (Evans, 1984; 1989; Evans & Over, 1996).

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